



Readiness and foresighting of higher learning institutions for large language model in Zanzibar: A student perspective

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Abstract

Generative Artificial intelligence systems, including large language models, are transforming higher education by providing real-time academic support, facilitating student engagement, and enabling personalized learning. As these technologies expand globally, understanding the preparedness of Zanzibar's higher education institutions to adopt them is essential. This study explores students' perspectives on institutional preparedness to integrate large language models into teaching, learning, and academic support systems. A qualitative design was employed, combining online surveys with roundtable discussions to assess students' access to technology, awareness of Generative AI, and their perceptions of its impact on educational settings. The findings show that 97.7% of students have access to essential technologies such as smartphones and internet connectivity, despite instability on some campuses. A significant majority of students demonstrate familiarity with Generative AI, and approximately 83% use it comfortably. Students perceive AI as beneficial for self-directed learning, academic performance, and career development. However, they also raised concerns about the accuracy of AI-generated content, the risk of plagiarism, and a potential decline in critical thinking. Institutional readiness varies widely: while students exhibit high awareness, institutions face challenges related to insufficient training, the absence of guidelines, and a lack of comprehensive ethical frameworks. The study underscores the need for a balanced, student-centered, and collaborative approach to integrating Generative AI in higher education. Greater investment in digital infrastructure, capacity building, the development of ethical guidelines, and active student involvement in AI policy formulation is foreseen as a responsible approach to effective, scalable adoption of Generative AI across academic institutions in Zanzibar.

Key words: *Artificial Intelligence; Generative AI; Higher Learning Institutions; Readiness*

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Introduction

The integration of Large Language Models (LLMs), also known as Generative Artificial Intelligence (GenAI) systems, has attracted significant attention in recent years. The AI-powered models have emerged as a transformative force in higher education, enhancing learning experiences, supporting research, and providing personalized tutoring (Dwivedi *et al.*, 2023). The ability of LLMs to process vast amounts of data, generate human-like text, and provide contextual responses makes them a valuable educational tool (Zhai, 2022). However, their successful implementation depends on institutional readiness and the resolution of associated challenges.

Generative AI has demonstrated its capacity to foster self-directed learning, improve academic performance, and support career development among students and staff (Mollick & Mollick, 2023). These AI-driven tools enable students to generate summaries, complete assignments, and receive personalized assistance. Several studies suggest that AI can foster critical thinking by prompting students to interact with content (Holmes, 2023; Kasneci *et al.*, 2023). However, while students are familiar with and interact with AI tools, institutional preparedness varies significantly. Research by Mhlanga (2023) indicates that, despite widespread access to technology, many universities lack structured AI policies and guidelines, making seamless integration challenging. A study by Bond *et al.* (2023) found that although universities recognize AI's benefits in education, concerns about ethical use, data privacy, and academic integrity remain prevalent.

The adoption of Generative AI in higher education can be better understood through the well-established theories, such as the Technology Acceptance Model (TAM). TAM, as explained by Davis (1989), advocates that users' acceptance of a new technology is primarily shaped by their perceptions of its usefulness and ease of use, which together influence intention, perceptions, and actual adoption. In the context of AI tools and LLMs, students' willingness to engage with these systems is not only about access but also about whether they believe AI

enhances learning efficiency and is helpful within their academic routines. Khanfar *et al.* (2024) and Amir-Rudin *et al.* (2024) credited the application of TAM in education settings in recent years. They showed positive outcomes in predicting students' continued use of AI-driven learning tools, while concerns about ethical risks, accuracy, and trust moderate their acceptance levels.

Student readiness for AI adoption in academia is primarily influenced by access to technology and prior exposure to AI tools (Selwyn, 2023). In Zanzibar, where 97.7% of students have access to smartphones and internet connectivity, technological barriers to AI adoption are minimal. According to a study by Zhai *et al.* (2024), approximately 83% of students expressed confidence in using AI for learning, reflecting their inclination toward technology-driven education. Despite this enthusiasm, concerns persist regarding the accuracy of AI-generated content, ethical implications, and the potential erosion of critical thinking skills (Bodily & Verbert, 2023). Furthermore, accessibility does not always translate to practical usage, as students require training to optimize AI tools effectively. According to Aoun (2023), a well-prepared institutional framework is critical for ensuring students use AI responsibly and productively.

One of the challenges in integrating AI into education is its impact on academic integrity, particularly plagiarism (Roose, 2023). The ease with which students can generate essays, research papers, and reports using AI raised concerns about authenticity and originality (Cotton *et al.*, 2023). Additionally, biases in AI-generated content persist, as LLMs often inherit biases from their training data (Weidiger *et al.*, 2022). Another ethical concern is data privacy, as AI systems require vast amounts of data for training. This raises questions about how student interactions with AI tools are recorded, stored, and used. According to Florid and Cows (2023), ensuring transparency and accountability in AI-driven education is critical to maintaining ethical standards. Higher education institutions must establish clear guidelines and frameworks to mitigate these risks.

While AI literacy among students grows, institutional readiness for AI implementation in higher education varies widely. Research by

Luckin *et al.* (2022) suggests that universities that invest in AI infrastructure, such as cloud computing resources and AI-based learning management systems, tend to facilitate smoother integration of AI into education. In Zanzibar, student awareness and technical access may need to be improved to support technical support, faculty training, and curriculum restructuring to accommodate AI-driven learning models. According to Wang *et al.* (2024), universities should adopt a balanced approach that incorporates AI without compromising traditional values. For AI to be successfully integrated into higher education, institutions must adopt a student-centered, collaborative approach (Gursoy *et al.*, 2023). The strategy involves developing comprehensive AI policies and ethical guidelines to ensure responsible use.

Since the rapid rise of AI technologies, researchers have been actively investigating the field's core benefits and challenges. Sohail (2023) and Ivanov *et al.* (2024) are the latest researchers exploring these themes. As Higher Learning Institutions (HLIs) and their stakeholders increasingly explore AI technology to enhance academic activities, assessing their readiness to integrate Generative AI from the perspective of students, the primary users of these tools, becomes essential. However, while interest in generative AI within HLIs is rising, there is a gap in the limited research, particularly in the global south, on the key dimensions of readiness, including ethical safeguards, pedagogical integration, and infrastructural capacity, highlighting the limitations in both students' and institutional preparedness identified in the global context. Factors such as technological infrastructure, accessibility, institutional support, student awareness, and perceptions of Generative AI's educational impact all play crucial roles.

There has been a significant increase in the adoption of Generative AI across various fields, with HLIs emerging as key users. However, this adoption has sparked debate regarding its advantages and challenges within an academic context. For example, Keiper *et al.* (2023) highlight both the positive and negative aspects of AI, illustrating its potential benefits for knowledge generation while cautioning about its limitations. Similarly, Dwivedi *et al.* (2023) examine the impact of generative AI in education and business

and identify key areas for further research, including transparency of knowledge, ethics, and educational implications. Gill *et al.* (2024), in the same context, found that AI tools like ChatGPT can provide coherent responses, regardless of whether they often lack consistency, but their benefits are massive. Other researchers who see generative AI as pivotal for future academic and non-academic knowledge creation are Haleem *et al.* (2023), Essel *et al.* (2023), Farhi *et al.* (2023), and Thomas *et al.* (2024). However, they emphasize the need for improving AI's underlying architecture to enhance accuracy. Yu (2024) discusses the implications of Generative AI in higher education, which in fact need to be understood, particularly its ethical, safety, and plagiarism-related concerns.

From an educational perspective, Al-khresheh (2024) emphasizes the need for professional development and curriculum adjustments to maximize AI's benefits in language teaching. Javaid *et al.* (2023) anticipate that AI tools will become valuable for enriching both students' and teachers' experiences, despite some limitations. These studies underscore the transformative yet complex role of Generative AI in HLIs, highlighting the need for a balanced integration supported by robust institutional frameworks.

This study investigates Artificial Intelligence readiness in HLIs, specifically Generative AI, from the perspective of students in Zanzibar, a particular context relevant due to its rapidly expanding higher education sector and growing national and international interest in AI adoption, making it a suitable representative case for understanding challenges in small island states and global south settings. In complementing the assessment of readiness among HLIs, the study examines how current students perceive future signal opportunities and challenges by linking current understanding with anticipated institutional needs, providing insight into both the current state and future direction of AI adoption in Zanzibar, specifically in higher learning institutions. Using a multifaceted approach that includes an online survey and roundtable discussions, this study gathers insights from students on AI's potential and challenges in education. The findings reveal that 98% of students have access to the necessary technology and are familiar with AI, with only 7%

reporting no prior use of AI tools. Despite a general openness to AI (83% comfortable with its use), students express concerns about accuracy and the potential impact on critical thinking, with 49% worried that over-reliance on AI could weaken their analytical skills. The results highlight the need for institutional support, such as training, infrastructure, and guidelines, to promote responsible and effective AI integration in academic environments.

Materials and methods

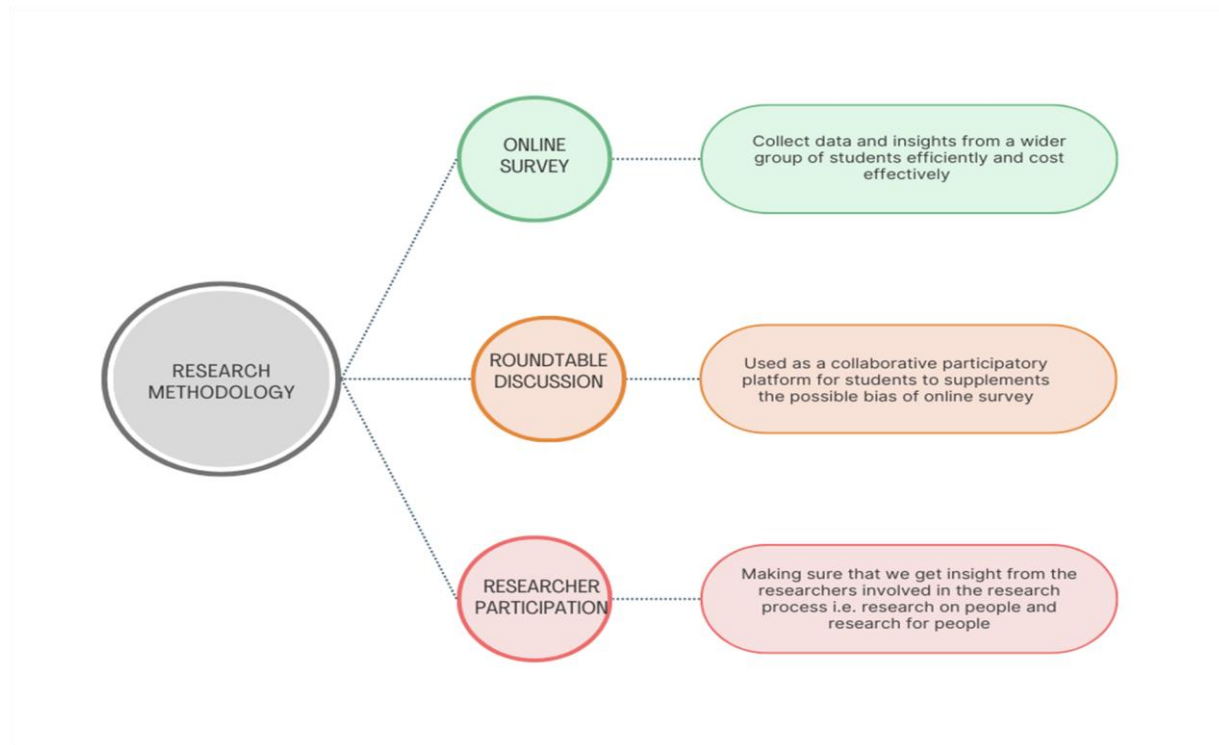
The study employs a qualitative research approach to explore students' perspectives on the adoption and integration of large language Models (LLMs) in higher learning institutions (HLIs). The research was conducted randomly among a sample of two hundred and fifteen (215) students from six universities located across Zanzibar. These students were drawn from both undergraduate and postgraduate levels, ensuring a rich diversity

of demographic backgrounds, academic disciplines, and levels of experience with educational technologies. This broad representation aimed to capture a wide range of viewpoints on the opportunities, challenges, and implications of integrating LLMs into higher education. To ensure the ethical safeguarding of the research, the online survey includes consent requirements from participants before the interview.

To complement the breadth of data obtained through the survey, the researchers organized virtual roundtable discussions to gain deeper insights into students' experiences and attitudes, particularly those that could not be fully captured by the survey's structured questions (see Figure 1). This twin-method approach was deliberately chosen to balance breadth and depth, using the study to identify key patterns and the roundtable to probe deeper into specific themes.

Figure 1

Visual presentation of the mixed research methodologies



Roundtable discussions, by design, are structured, interactive sessions that typically involve six (6) to fifteen (15) participants and are facilitated by one or more moderators. These discussions provide an open space for participants to exchange views, challenge assumptions, and reflect collaboratively on shared experiences. For this study, a 90-minute online session titled, "Students' perspectives on the Adoption and Integration of Large Language Models in Higher Learning Institutions" was conducted. A total of 14 participants took part in the discussion, including 12 students and two trained moderators. The students were enrolled in three undergraduate programs: Bachelor of Science in Computer Science (BScs), Bachelor of Information Technology Application and Management (BITAM), and Bachelor of Information Technology with Accounting (BITA). The participants were selected using a purposive sampling approach across three undergraduate programs to ensure representation among technology students. The selection was based on eligibility in at least the second year, having prior experience using a generative AI tool, and willingness to discuss the topic. Recruitment was

announced in the class, on WhatsApp groups, and through coordination with class representatives. After the intensive screening, 12 eligible participants were invited. The data were analyzed through open coding by two researchers, who met regularly to compare interpretations and strengthen the validity of the findings.

The use of both surveys and roundtable discussions aimed to harness the unique strengths of each method. The survey offered a structured overview of students' subscriptions across institutions, while the roundtable discussions enabled a deeper, more dialogic exploration of critical issues. The virtual format proved particularly beneficial, offering greater flexibility and convenience and allowing the participants to engage meaningfully from their own environments. This setup encouraged candid and reflective dialogue and helped minimize logistical constraints often associated with in-person focus groups.

Several key themes guided the discussion. These are student's awareness and understanding of

LLMs, their current use cases and experiences, the technological readiness of institutions, and challenges such as access, equity, ethics, and privacy. Participants shared their firsthand experiences using LLM tools such as ChatGPT, Bard, and others in academic contexts, including for research, writing, coding, and problem-solving. Discussion also highlighted concerns related to over-reliance, academic integrity, data privacy, and the digital divide, especially for students with limited access to stable internet devices.

By focusing on these dimensions, the study sought to provide a holistic assessment of how LLMs are perceived and used by students, as well as their potential benefits and risks with HEIs. This approach aligns with previous research by Kontogeorgios *et al.* (2021) and Steele *et al.* (2022), which emphasized the value of combining traditional survey methods with interactive qualitative formats such as roundtables. Such methodologies have been shown to yield comprehensive and nuanced insights, particularly in emerging fields where user experience is dynamic and evolving. In addition, the researchers in this study have been actively engaged in higher education institutions' education systems for over a decade. Their extensive experience was considered a valuable asset in shaping and implementing the research process. As all practitioners and investigators do, they held dual roles that enabled them to reflect critically on institutional practices and student experiences. This study also employed the Participatory Action Research (PAR) approach, allowing researchers and participants to collaboratively investigate the integration of LLMs in education, thereby strengthening the research's relevance, inclusivity, and applicability to real-world scenarios.

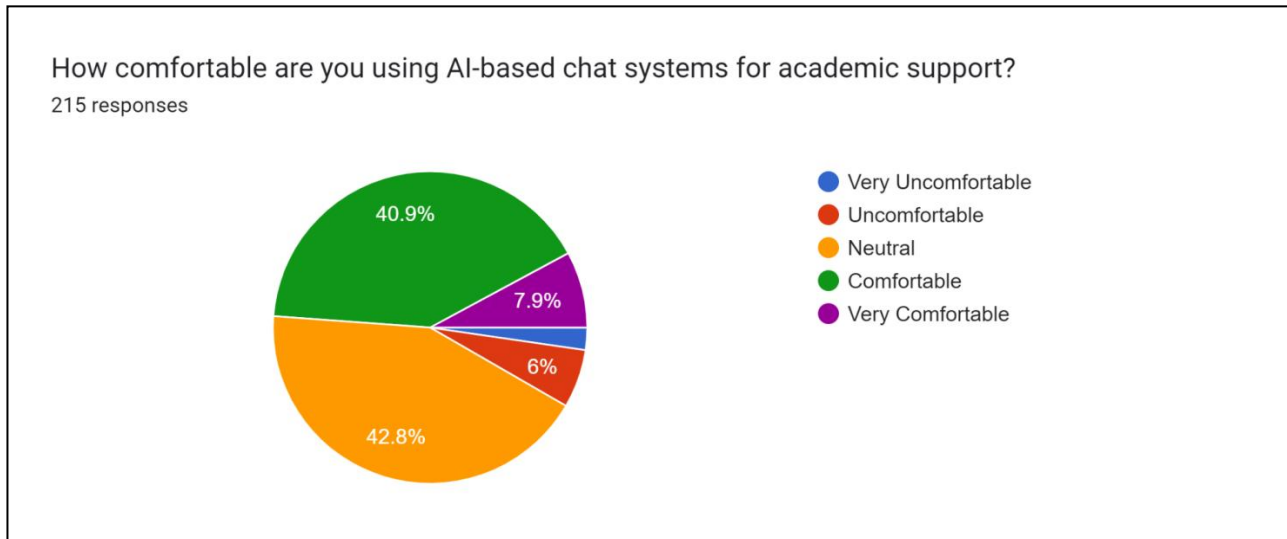
In conclusion, the methodological framework adopted in this study not only enabled a detailed exploration of students' experiences with LLMs but also demonstrated the utility of qualitative approaches in educational research. The engaging nature of roundabout discussion, especially in an online format, and the domain context of the researchers made the trinity methods effective in surfacing diverse perspectives. They may serve as a model for future investigations into digital transformation in higher education.

Results

Researchers surveyed to understand students' perspectives on generative AI-based educational content, such as ChatGPT, focusing on individual readiness and institutional preparedness. The survey revealed that Tanzanian university students are predominantly aged 16 to 27, with 56.3% female and 43.7% male respondents. Notably, 97.7% of the participants reported owning personal computers, showcasing a solid foundation for digital adoption. Additionally, 93% of students had prior experience with AI tools, and 83% expressed comfort using AI for academic purposes, indicating significant familiarity and openness to these technologies. The survey highlighted students' largely positive perceptions of AI content generators, as shown in Figure 2. Approximately 41% of respondents expressed satisfaction with these systems, while 43% were neutral, potentially reflecting the technology's novelty.

Figure 2

Students' perceptions on the use of AI content generator systems in Zanzibar

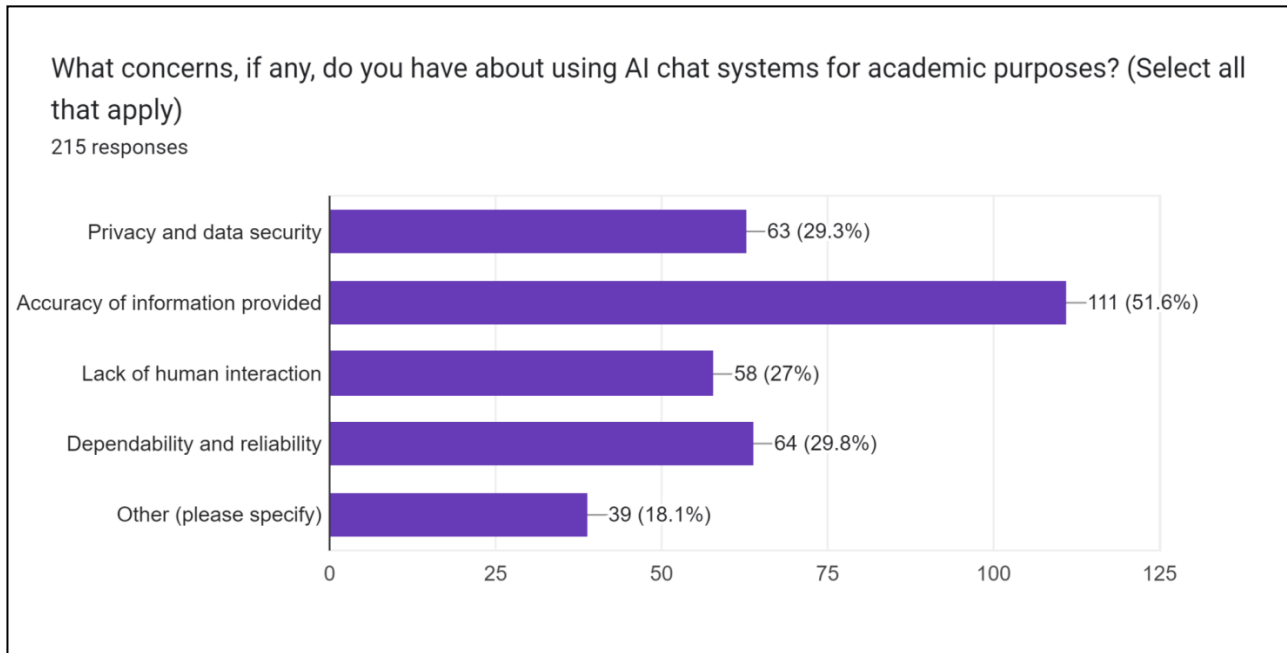


About 50% of the students agreed that the AI tool provides personalized learning experiences, enhances practical skills, and extends knowledge. Sixty-two (62%) of respondents supported integrating AI systems into university support services, aligning with global trends of increasing AI adoption in higher education. This sentiment aligns with Tanzania's government investments in AI technologies, such as the deployment of AI robots, signaling a strong institutional interest in

leveraging AI for educational purposes. However, several challenges emerged. With accuracy standing out as the most cited concern by the participants who questioned the reliability of AI-generated content in Figure 3, reflecting broader scholarly findings such as Al-Khresh (2024), who highlights how current AI lacks some pedagogical expectations due to inconsistency and limited contextual understanding.

Figure 3

Issues related to AI Chat Systems in Zanzibar

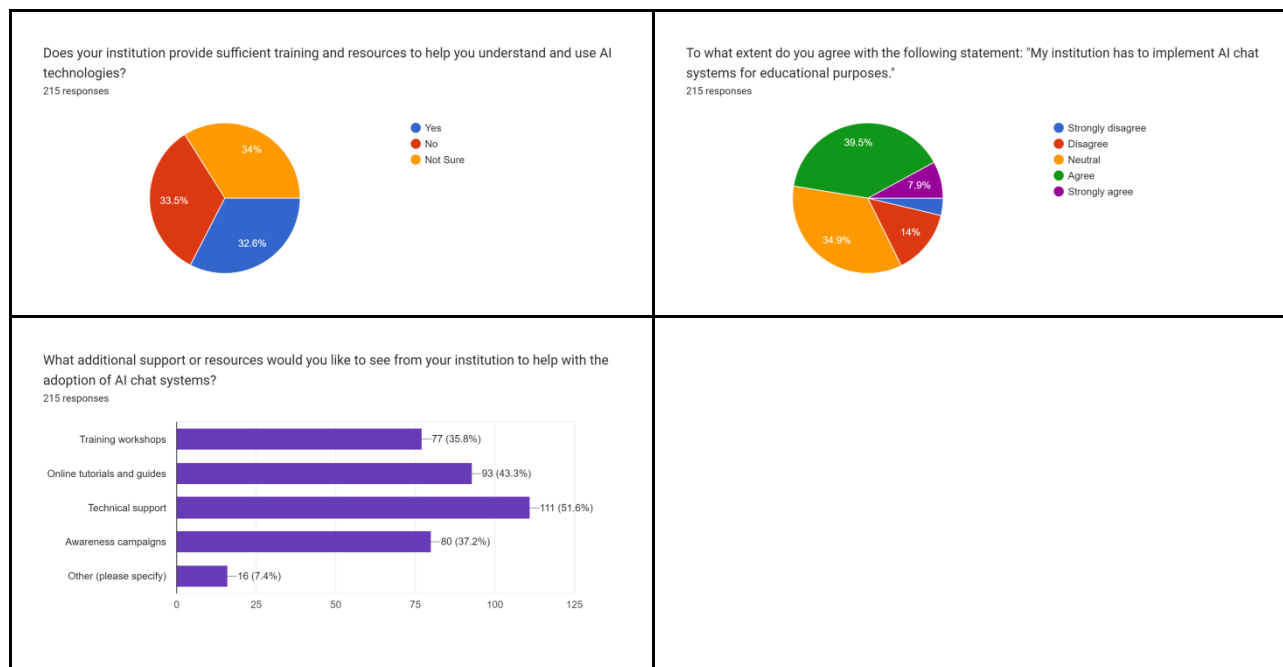


Privacy and data security (29.3%), accuracy (51.6%), and the lack of human interaction counts (27%) were identified as key concerns, consistent with Alser (2023), who highlighted similar sensitivities that require institutional attention (Figure 4). Issues related to the reliability and validity of Generative AI were also discussed in Yu (2024) in his study to determine the role of teachers in AI-supported educational transformation, and further emphasized in the review study conducted by Hao *et al* (2024). While accuracy was a critical concern with the reported figure of 51.6% of

respondents, students also reported that 57% experienced inaccuracies in AI responses, underscoring the need for domain knowledge to evaluate AI outputs critically. Beyond technical limitations, respondents expressed fears about over-reliance on AI tools, with 49.3% agreeing that overuse of AI chat systems may weaken their critical thinking capacity. Lastly, institutional readiness also appeared with mixed reflections. Although some academic institutions are investing in AI infrastructure, 40.5% of respondents remained neutral to qualify their institutional ability to mitigate AI-related risks.

Figure 4

Institutional Support of AI among the Higher Learning Institutions in Zanzibar



Discussion

Discussions and Implications

The Students emphasized the importance of institutional initiatives to maximize the benefits of Artificial Intelligence (AI) while mitigating its associated challenges. Key recommendations included technical support, awareness campaigns, and the establishment of clear guidelines to ensure the ethical and practical use of AI in education settings (Figure 3). These measures would enable students and educators to leverage AI’s capabilities while maintaining academic integrity and fostering a responsible learning environment.

The open-ended feedback from students reinforced AI’s numerous advantages, including promoting independent learning, enhancing accessibility, reducing costs, facilitating skills development, and providing personalized educational support. AI-driven tools were recognized for their ability to create tailored experiences that cater to students’ diverse needs and learning paces. Therefore, integrating AI into education can potentially democratize learning opportunities, particularly for students with disabilities or those from underprivileged

backgrounds.

However, alongside these benefits, students also voiced concerns about potential drawbacks. A significant issue was the over-reliance on AI, which could undermine essential cognitive skills such as critical thinking, creativity, and self-directed learning. If students become overly dependent on AI-generated content, they may struggle to develop independent problem-solving skills. This concern aligns with broader academic debates about balancing AI augmentation and human intellectual development.

Another critical aspect discussed was the ethical implementation of AI in education. Students expressed apprehension that AI could diminish the human-centered nature of learning, raising concerns that excessive automation might depersonalize the educational experience. The risk of replacing meaningful human interactions with AI-driven instruction could lead to a lack of mentorship, emotional intelligence development, and nuanced understanding, all of which are crucial to holistic education.

Students proposed several strategies to optimize AI integration in academic environments and

address these challenges. These include targeted training programs to equip educators and students with AI literacy, infrastructure development to support seamless AI adoption, and the formulation of robust policies that ensure responsible AI usage. By implementing these measures, educational institutions can create an ecosystem that harnesses AI's advantages while safeguarding against potential risks.

Awareness and understanding of Large Language Models (LLMs)

A significant theme that emerged from the roundtable discussion was students' awareness and understanding of large language models (LLMs). LLMs, such as ChatGPT, POE, GEMINI, and SARUFI, have gained widespread popularity in academic settings. These tools have proven beneficial in providing learning resources, supporting self-study, and assisting students in tasks ranging from writing assignments to problem-solving. However, despite these benefits, students noted several challenges associated with using LLMs. One primary concern was the accuracy of AI-generated outputs. Students highlighted instances in which AI tools provided incorrect or misleading information, potentially affecting the quality of their academic work. The findings align with those of Ivanov *et al.* (2024) and Saetra (2023), who emphasized the importance of critical engagement with AI-generated content rather than an unquestioning reliance on it. The issue of AI-generated misinformation raised the need for students to develop verification skills to cross-check AI-generated data against credible academic sources. This misunderstanding further underscores the need for students to have domain knowledge of the theme before content generation.

Task-specific limitations were another point of discussion. For instance, students pointed out that while ChatGPT and similar models are adept at handling general academic queries, they struggle with specialized fields such as cybersecurity. This limitation challenges students in technical disciplines that require highly accurate, domain-specific insights. Similar concerns have been echoed by Yin *et al.* (2023), who noted that AI-driven academic assistance may not yet be sophisticated enough to replace subject-matter expertise.

Additionally, the potential for AI to erode critical thinking skills was a recurring concern. Students acknowledged that while AI tools offer convenience, over-reliance on these systems could lead to intellectual complacency. Without proper guidance on using AI as a supplementary tool rather than a primary source of knowledge, students risk becoming passive consumers of information rather than active learners who engage critically with their studies.

Despite these challenges, students expressed enthusiasm for embracing LLM technology, recognizing its potential to enhance self-directed learning and provide career-related support. AI's ability to generate personalized learning recommendations, assist in resume building, and offer industry insights positions it as a valuable tool for academic and professional growth. These perspectives align with research by Daye *et al.* (2024), which highlights the role of AI in fostering independent learning and offering customized educational support.

Striking Balance for the Responsible AI Integration

The discussion underscores the dual nature of Artificial Intelligence (AI) in education, emphasizing both its transformative potential and the challenges it presents. AI has the capacity to ensure learning experiences, streamline academic processes, and support personalized education. However, its unregulated use introduces risks that require careful management. To optimize AI integration, institutions must implement structured training programs focused on AI literacy and awareness. These programs should educate students on the strengths and limitations of AI tools, helping them integrate AI into higher education curricula and empowering them to engage with AI technologies responsibly and ethically.

In addition to training, institutional investment in AI-compatible infrastructure is essential. Such systems should support seamless AI integration while prioritizing data privacy, digital equity, and ethical standards. Educators also need targeted training to effectively guide students in navigating AI-enhanced academic environments. Their understanding of AI tools will enable them to model appropriate usage and address concerns

when they arise. Furthermore, the development of comprehensive institutional policies is critical; these policies should address key areas such as academic integrity, responsible AI deployment, and the importance of maintaining a human-centered pedagogy. Clear guidelines will help reduce instances of plagiarism and misuse, reinforcing the integrity of learning outcomes. The responsible adoption of AIO in education requires a coordinated effort involving student training, educator support, infrastructure development, and policy enforcement to ensure that AI serves as a tool for enhancement rather than a source of disruption.

Conclusion

This study highlights the dual promise and inherent challenges of integrating Artificial Intelligence (AI) systems, particularly Large Language Models (LLMs), into Higher Learning Institutions (HLIs). Many students already possess the necessary digital infrastructure, such as internet access, devices, and digital literacy skills, which enable them to use AI tools effectively. They recognize the benefits of AI in enhancing their academic experiences, particularly in areas such as self-directed learning, improved access to knowledge, and support for career development.

It is well known that the LLMs offer a wide range of applications in education. These include helping with research, gathering study materials, providing language support, and even assisting with critical thinking and problem-solving exercises. Students have reported that these LLM systems help them study more efficiently and develop a broader understanding of complex subjects. The ability to receive instant feedback and clarification on various topics significantly contributes to personalized learning pathways.

Despite these advantages, integrating AI into HLIs also presents several challenges that must be carefully addressed. Concerns around the accuracy and reliability of AI-generated content remain prominent, as these systems can occasionally produce misleading information. Ethical considerations, such as privacy, plagiarism, and academic honesty, are also critical concerns for the informants. Moreover, there is

growing concern that excessive reliance on AI could undermine students' ability to think critically and engage deeply with the content. These issues underscore the importance of adopting a balanced and informed approach to AI implementation.

From an institutional perspective, readiness for AI integration is mixed. While there is recognition of AI's potential, many institutions still face critical challenges, such as inadequate infrastructure, unclear guidelines, and insufficient risk management strategies. The authorities must proactively address these gaps to ensure a smooth, responsible transition to AI-supported education. To overcome these challenges, universities and other educational stakeholders must take several key steps. First, investment in modern, reliable infrastructure is essential, and institutions should ensure that students and staff have access to the tools and technologies they need. Second, comprehensive training programs should be developed to familiarize educators and learners with AI systems, enabling them to use these tools effectively and ethically. Third, clear institutional policies and ethical frameworks must be established to govern AI use, addressing concerns such as data privacy, intellectual property, and academic integrity.

Moreover, ongoing technical support and monitoring mechanisms should be implemented to build user trust and ensure system reliability. Involving students in the implementation process through regular feedback and participatory evaluation will further help refine strategies and align them with actual needs and expectations. In conclusion, while students recognize AI's transformative potential in higher education, they are also aware of its challenges. By focusing on strategic implementation through training, infrastructure development, and ethical policy-making, institutions can harness AI's benefits while recognizing the value of human-centered, ethical learning. This balanced approach ensures that AI remains a powerful and responsible tool for advancing education. Moreover, students' observations not only highlight the current state of institutional readiness for the art but also provide insights into the needs and future expectations that should be addressed to ensure responsible and sustainable AI integration.

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The authors confirm that Artificial Intelligence (AI) has not been used to generate any content in the manuscript, including text, figures, images, and code. However, AI has been utilized solely to enhance the quality of the manuscript, including improving English proficiency. This statement applies to the paper entitled "**The readiness and Foresighting of Higher Learning Institutions for Large Language Models: Students Perspective**".

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